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REPORT ON CONSULTATION ON THE NORTHWEST NEVADA INTRASTATE AIR QUALITY CONTROL REGION (NEVADA)

National Air Pollution Control Administration
Washington, D. C.

October 1970

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ON THE
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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service

REPORT FOR CONSULTATION

ON THE

NORTHWEST NEVADA

INTRASTATE AIR QUALITY CONTROL REGION

(Nevada)

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
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October 1970

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SECTION I

THE REGIONAL APPROACH TO AIR QUALITY CONTROL AND A FEDERAL PROPOSAL FOR NORTHWEST NEVADA

PREFACE

The Clean Air Act, as amended, directs the Secretary of Health, Education, and Welfare to designate "air quality control regions" to provide a basis for the adoption of regional air quality standards and the implementation of those standards. The Act stipulates that the designation of a region shall be preceded by consultation with appropriate State and local authorities. This report is intended to provide background material for the consultation. It proposes boundaries for the Northwest Nevada Intrastate Air Quality Control Region and discusses the factors which are the basis of the boundary proposal.

The National Air Pollution Control Administration (NAPCA) has established a policy by which States may propose to the Federal Government boundaries for air quality control regions. Nevada is the fourth State to initiate proposals for region boundaries under this policy. The State of Nevada, Bureau of Environmental Health, and the Washoe City-County District Health Department, with assistance from NAPCA, has conducted a study of the Reno-Carson City area, the results of which are presented in the body of this report. The Region boundaries proposed in the report reflect consideration of available and pertinent data; however, the boundaries remain subject to revision suggested by consultation between Federal, State, and local authorities. Formal designation of a region will be made only after careful review of all opinions and suggestions submitted during the consultation process. This report is intended to serve as the starting point for the consultation.

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INTRODUCTION

THE REGIONAL APPROACH

Air pollution in the urban areas of the United States is a regional problem which frequently extends across State and local governmental boundaries. Since air pollution problems are rarely confined to any single municipality or county, successful control requires coordinated planning, standard setting, and enforcement by the several political jurisdictions which share a common problem. At present, State and local governments across the Nation have only begun to develop a regional approach to air pollution control.

The Clean Air Act, as amended, provides a regional approach which depends upon coordination and cooperation between all levels of government: municipal, county, State, and Federal. To set in motion the machinery for regional air pollution control, the Department of Health, Education, and Welfare first designates air quality control regions, issues air quality criteria, and publishes reports on control techniques. The region designation indicates which State and local jurisdictions will be involved in a regional air pollution control effort. The air quality criteria indicate the extent to which various concentrations of an air pollutant are harmful to health and damaging to property. The reports on control techniques provide information on the costs and effectiveness of various techniques for controlling air pollutant emissions.

After the Department of Health, Education, and Welfare completes these initial steps, State governments develop air quality standards and plans for implementation of those standards for portions of air quality control regions within their boundaries. An air quality standard defines the desired limit on the concentration of a pollutant in the ambient air of the region. It constitutes the degree of air quality which the regional control program will attempt to achieve. An implementation plan is a blueprint of the steps which will be taken to insure achievement of the air quality standards within a reasonable time. The Governors have 90 days to submit letters indicating that they intend to set standards, 180 days in addition to set the standards, and 180 days further to develop plans for implementing them. The procedure for setting standards includes a public hearing which allows residents of a region to express their views concerning desired standards.

The Department of Health, Education, and Welfare reviews air quality standards and implementation plans in order to ascertain their consistency with the provisions of the Clean Air Act, as amended.

When air quality standards and implementation plans are approved, States proceed to prevent and control air pollution in accordance with those standards and plans. This system for establishing a regional approach to air pollution control is depicted in the flow diagram in Figure 1.

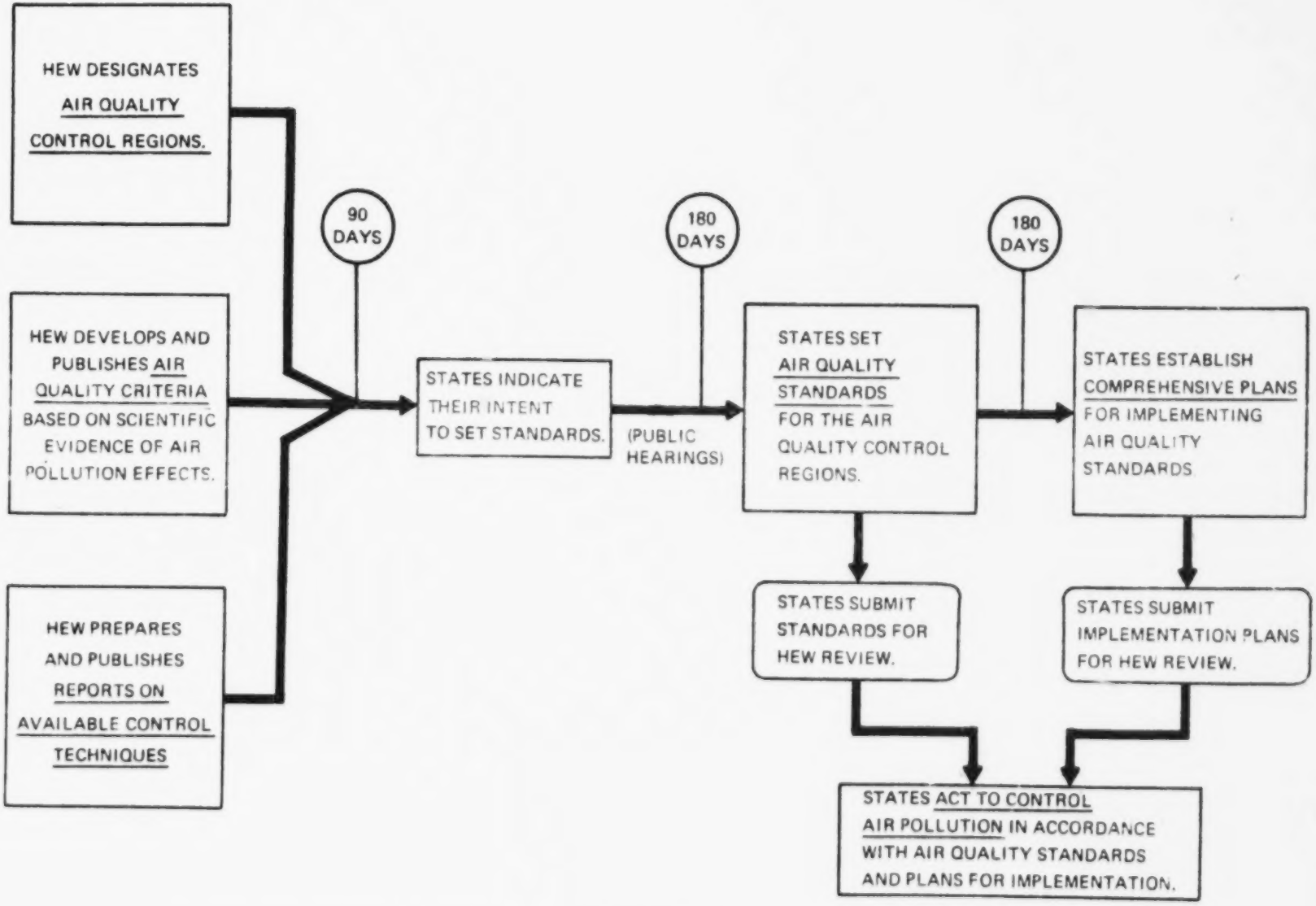

HEW DESIGNATES AIR QUALITY CONTROL REGIONS.
HEW DEVELOPS AND PUBLISHES AIR QUALITY CRITERIA BASED ON SCIENTIFIC EVIDENCE OF AIR POLLUTION EFFECTS.
HEW PREPARES AND PUBLISHES REPORTS ON AVAILABLE CONTROL TECHNIQUES
90 DAYS
STATES INDICATE THEIR INTENT TO SET STANDARDS.
180 DAYS
(PUBLIC HEARINGS)
STATES SET AIR QUALITY STANDARDS FOR THE AIR QUALITY CONTROL REGIONS.
180 DAYS
STATES ESTABLISH COMPREHENSIVE PLANS FOR IMPLEMENTING AIR QUALITY STANDARDS
STATES SUBMIT STANDARDS FOR HEW REVIEW.
STATES SUBMIT IMPLEMENTATION PLANS FOR HEW REVIEW.
STATES ACT TO CONTROL AIR POLLUTION IN ACCORDANCE WITH AIR QUALITY STANDARDS AND PLANS FOR IMPLEMENTATION.

Figure 1 FLOW DIAGRAM FOR ACTION TO CONTROL AIR POLLUTION ON A REGIONAL BASIS, UNDER THE CLEAN AIR ACT, AS AMENDED.

DESIGNATION OF AIR QUALITY CONTROL REGIONS

Designation of an air quality control region is one of the first steps in the regional approach to air pollution control. As stipulated in Section 107(a)(2) of the Act, the designation of air quality control regions should be based on "jurisdictional boundaries, urban-industrial concentrations, and other factors including atmospheric areas necessary to provide adequate implementation of air quality standards." The language suggests a number of objectives which are important in determining how large an air quality control region should be. Basically, these can be divided into three separate categories.

First, a region should be self-contained with respect to air pollution sources and receptors. In other words, a region should include most of the important sources in the area as well as most of the people and property affected by those sources. Unfortunately, since air pollutants can travel long distances, it is impractical if not impossible to delineate regions which are completely self-contained and the air over a region will usually have at least trace amounts of pollutants from external sources. The dividing line between "important influence" and "trace effect" will be a matter of judgment. The judgment should be based on estimates of the impact a source has upon a region and the level of pollution to which receptors are subjected.

The second general objective requires that region boundaries be designed to meet not only present conditions but also future conditions. In other words, the region should include areas where industrial and residential expansion are likely to create air pollution problems in the foreseeable future. This would then result in the designation of regions which will contain the sources and receptors of regional air pollution for a number of years to come.

The third objective is that region boundaries should be compatible with and even foster unified and cooperative governmental administration of the air resource throughout the region. Air pollution is a regional problem which often extends across several municipal, county, and even State boundaries. Clearly, the collaboration of several governmental jurisdictions is prerequisite to the solution of the problem. Therefore, the region should be delineated in a way which encourages regional cooperation among the various governmental bodies involved in air pollution control. Usually it is possible to preserve the unity of county governments by including or excluding them in their entirety. Occasionally, this is impractical due to a county's large size, wide variation in level of development, or striking topographical features.

To the extent that any two of the above three objectives lead to incompatible conclusions concerning region boundaries, the region must represent a reasonable compromise. A region should represent the best way of satisfying the three objectives simultaneously. Additionally, the region's boundaries should be selected to enhance and protect the future air resources of the area.

Procedure for Designation of Regions

Figure 2 illustrates the procedures used by the National Air Pollution Control Administration for designating air quality control regions.

After evaluating relevant factors, the National Air Pollution Control Administration publishes a proposed delineation of the region boundaries. The next step is for NAPCA to set a time and place for a consultation meeting and to distribute to State and local authorities a report for the evaluation study which includes the boundary proposal. At the consultation meeting, State and local authorities are encouraged to present fully their views and suggestions concerning the proposed boundaries of the region. Interested parties who do not have official status may submit comments in written form for the record. Following careful review of all suggestions and opinions submitted for the record by interested parties, the Secretary of Health, Education, and Welfare makes a formal designation of the region boundaries and notifies the Governors of the designation.

The remainder of this report contains the boundaries for the proposed interstate air quality control region and discusses the various factors and presents data which were the basis of the proposal.

The Region proposed in this report is considered on the whole to be the most cohesive and yet inclusive area within which an effective regional effort can be mounted to preve and control air pollution in the northwestern part of Nevada.

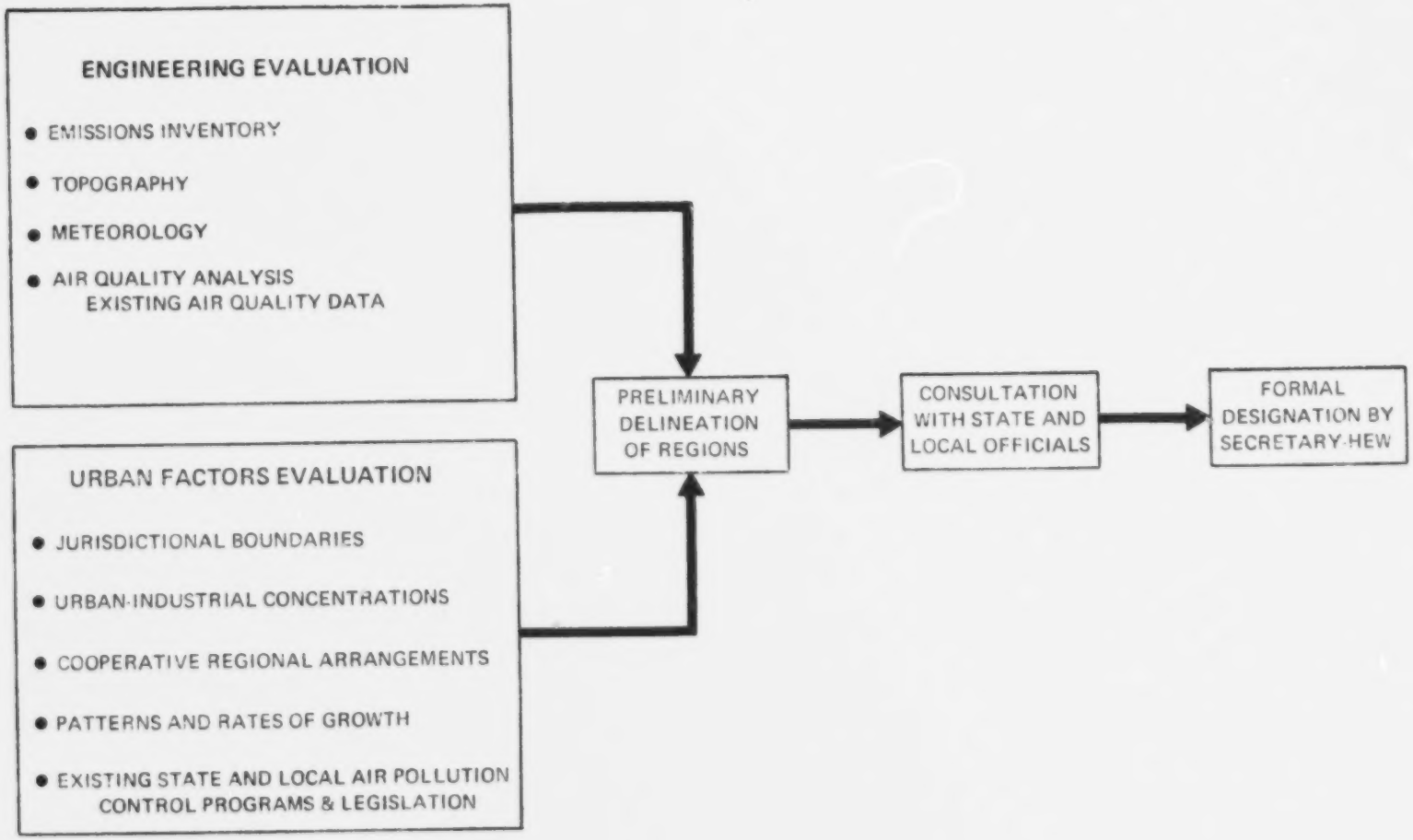

ENGINEERING EVALUATION
• EMISSIONS INVENTORY
• TOPOGRAPHY
• METEOROLOGY
• AIR QUALITY ANALYSIS
EXISTING AIR QUALITY DATA
URBAN FACTORS EVALUATION
• JURISDICTIONAL BOUNDARIES
• URBAN-INDUSTRIAL CONCENTRATIONS
• COOPERATIVE REGIONAL ARRANGEMENTS
• PATTERNS AND RATES OF GROWTH
• EXISTING STATE AND LOCAL AIR POLLUTION CONTROL PROGRAMS & LEGISLATION
PRELIMINARY DELINEATION OF REGIONS
CONSULTATION WITH STATE AND LOCAL OFFICIALS
FORMAL DESIGNATION BY SECRETARY HEW

Figure 2. FLOW DIAGRAM FOR THE DESIGNATION OF AIR QUALITY CONTROL REGIONS.

THE FEDERAL PROPOSAL

Subject to the scheduled consultation, the Secretary, Department of Health, Education, and Welfare, proposes to designate an air quality control region for the Reno-Carson City area consisting of the territory encompassed by the following jurisdictions:

In the State of Nevada:

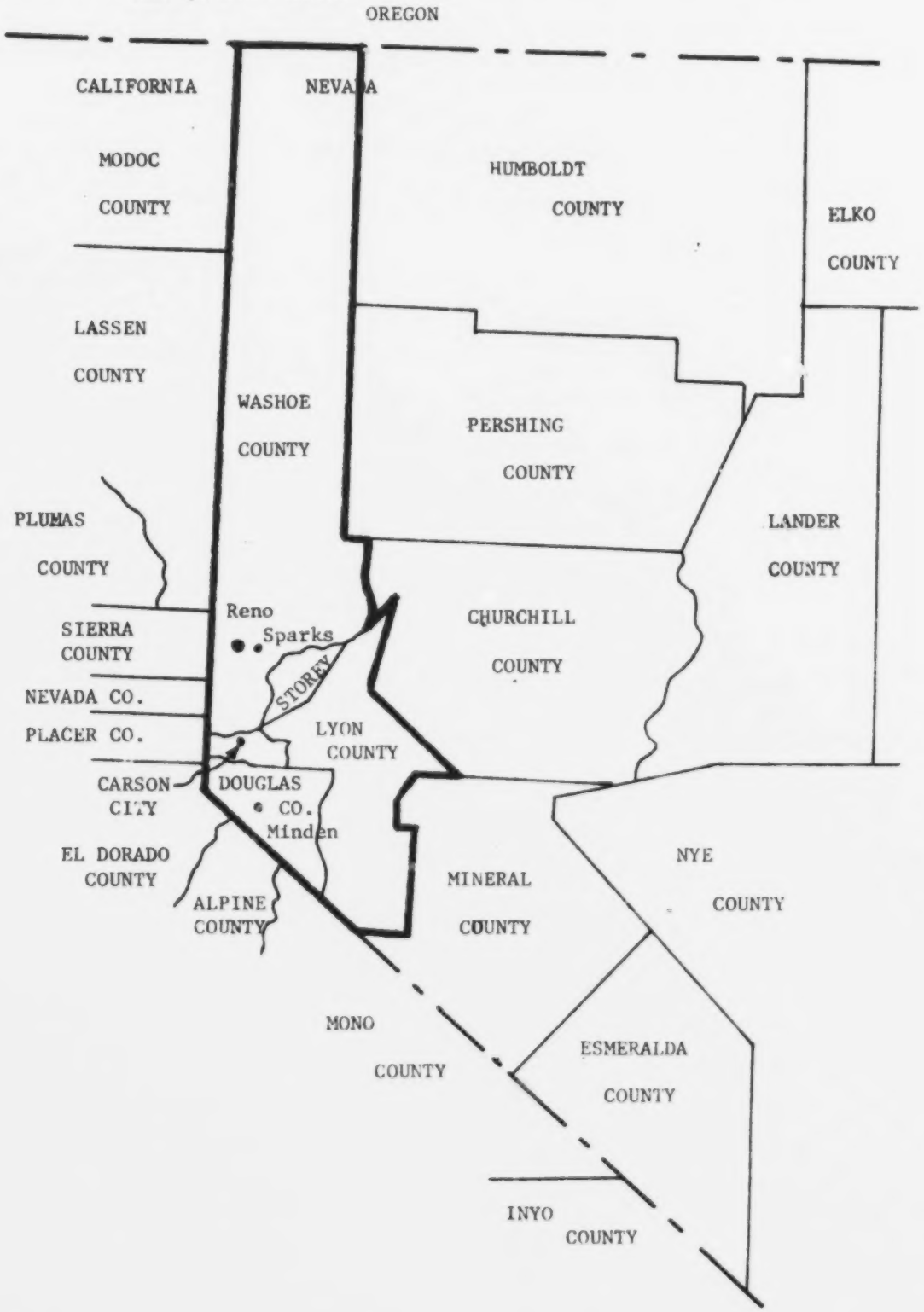
City of Carson City
Douglas County
Lyon County
Storey County
Washoe County

The proposed boundaries, illustrated in Figure 3, encompass the recommendation of the State of Nevada presented in Section II of this report.

The National Air Pollution Control Administration has reviewed the proposal and supportive discussion prepared by the State of Nevada. NAPCA concurs with the findings of the State and therefore proposes the above named counties as the Northwest Nevada Intrastate Air Quality Control Region. Most pollution sources and nearly all of the population in the northern part of Nevada is located within the proposed Region. Population growth has been relatively high in much of the core of the Region, especially in the Reno and Carson City areas, and along the shores of Lake Tahoe in Douglas County.

Finally, the scenic beauty and recreational potential for much of this Region requires the establishment of an air quality control region to enhance and protect the area's future environment.

FIGURE 3. PROPOSED BOUNDARIES FOR THE NORTHWEST NEVADA INTRASTATE AIR QUALITY CONTROL REGION.



SECTION II

ANALYSIS AND PROPOSAL FOR THE NORTHWEST NEVADA INTRASTATE AIR QUALITY CONTROL REGION BY THE STATE OF NEVADA

Prepared by the State of Nevada, Bureau of Environmental Health
and the Washoe City-County District Health Department

October 1970

PART A

EVALUATION OF ENGINEERING FACTORS

Climatological Summary

While temperatures on the whole are mild, the daily range between maximum and minimum is considerable, often exceeding 45°. Even when afternoon maximums reach the upper 90°'s, a light wrap is needed shortly after sunset. Nights with minimum temperatures over 60° are rare. Afternoon temperatures in mid-winter are moderate and, on an average, only six days a year fail to reach a temperature above freezing. More than half of the precipitation, falling largely as mixed rain and snow, occurs from December to March. Although there is an average of nearly 24 inches of snow a year, it is seldom more than three or four days at a time. Summer rain comes mainly as brief thundershowers in the middle and late afternoons. While precipitation is scarce, abundant water is available from the high altitude reservoirs in the Sierra Nevadas, where precipitation is heavy.

Humidity is very low during the summer months and moderately low during the winter. Fogs are rare and are usually confined to the early morning hours of mid-winter. Sunshine is abundant throughout the year.

The following charts depict data from the Reno-Sparks area and most of the other valley areas are similar. The presented data is not applicable to the mountainous regions, however.

TABLE I - TEMPERATURE (°F)

Month	Mean	Mean Maximum	Mean Minimum	Highest Record	Lowest Record
Jan.	31.2	45.7	16.6	68	-16
Feb.	36.3	50.9	21.6	70	-9
March	40.6	56.5	24.6	77	-2
April	47.7	65.1	30.3	87	13
May	55.3	73.2	37.3	94	20
June	61.5	80.8	42.1	100	25
July	69.6	91.8	47.3	104	35
Aug.	67.4	90.1	44.7	102	32
Sept.	60.5	83.3	38.7	101	21
Oct.	50.7	70.2	31.2	88	13
Nov.	40.2	57.1	23.3	77	1
Dec.	33.2	47.2	19.9	69	5

Precipitation and Humidity

TABLE 2

Month	Average Precipitation*	Relative Humidity** 0400	1000	1600
Jan.	1.04	82	67	54
Feb.	1.05	81	60	50
Mar.	0.70	77	46	35
April	0.46	76	34	28
May	0.48	76	34	28
June	0.42	76	31	24
July	0.23	72	26	20
Aug.	0.23	74	26	18
Sept.	0.22	76	31	21
Oct.	0.55	79	42	30
Nov.	0.64	81	55	43
Dec.	0.94	83	67	57
Year	6.96	78	44	34

* Precipitation in inches

** 4:00 a.m., 10:00 a.m., 4:00 p.m.

-Snowfall-

Mean Yearly Total----------25 inches

-Major Snowfall Months-

Nov.----------2.1 inches
Dec.----------3.7 inches
Jan.----------6.3 inches
Feb.----------4.8 inches
March----------5.3 inches
April----------1.4 inches

TABLE 3

WIND DATA

Month	Speed	Prevailing Direction
Jan.	6.1	S
Feb.	6.1	S
March	7.6	WNW
April	7.9	WNW
May	7.6	WNW
June	7.2	WNW
July	6.5	WNW
Aug.	6.2	WNW
Sept.	5.4	WNW
Oct.	5.3	WNW
Nov.	5.1	S
Dec.	5.1	SW
Year	6.4	WNW

TOPOGRAPHY

The map in Figure 4 shows the relationship of the various topographic features to the political jurisdictions of the study area.

Washoe County, being the largest of the five counties studied for the air quality control region, runs in a north-south direction. It is approximately 250 miles long and about 40 miles wide.

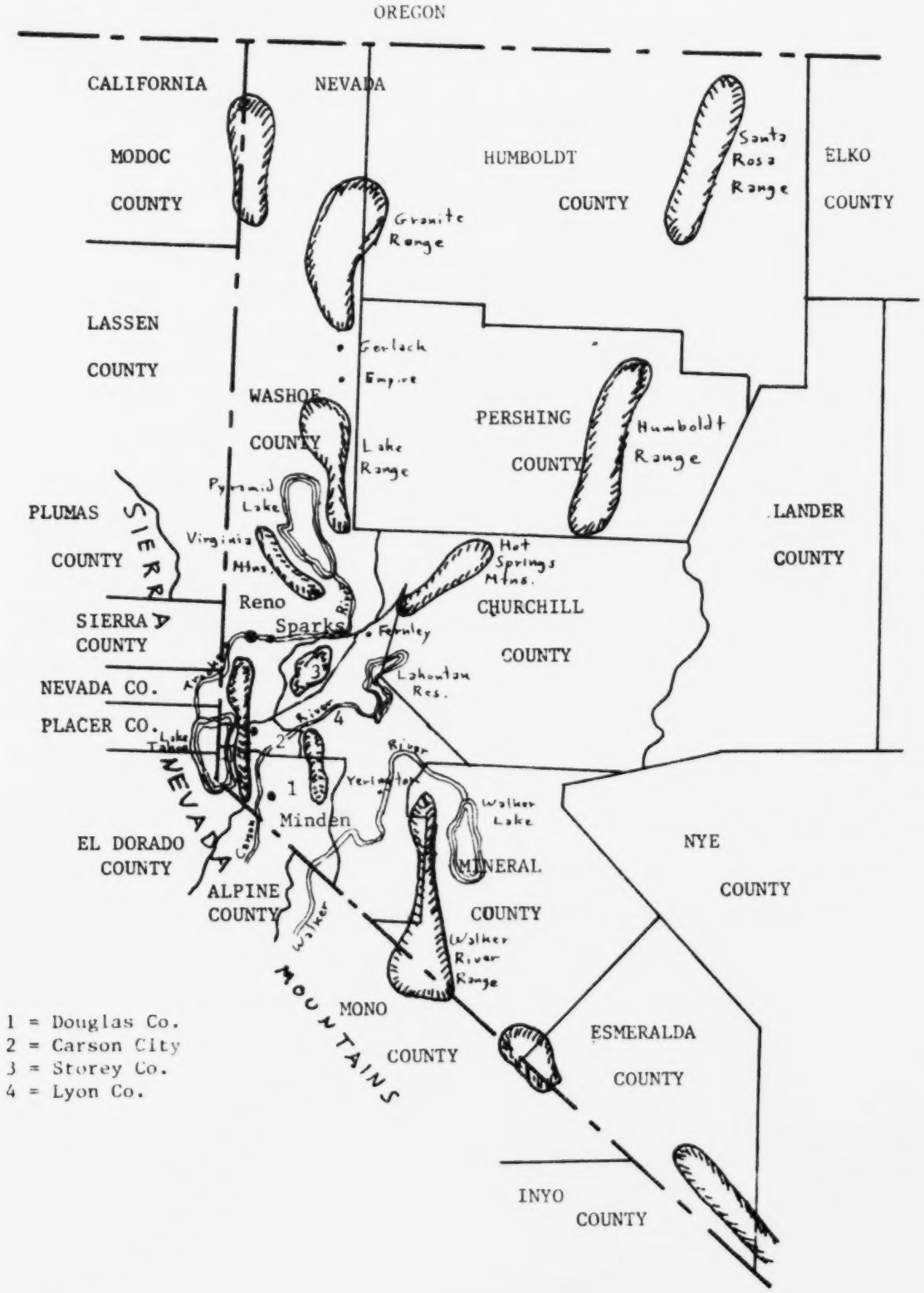
The northern half of the county, due mainly to extreme sparseness of population, was not included in the region. This area is primarily sagebrush, desert and mountains. However, some hardy souls have managed to carve out ranches and homesteads in this area. There are numerous dry lakes, a few wet lakes and some mountain streams, along with springs, which provide good deer and bird hunting.

The county and State roads that cross the area, for the most part, are unimproved dirt roads but are passable in a passenger car.

On the eastern boundary, about midway through the length of the county, are the towns of Gerlach and Empire. Gerlach is basically a railroad town along the Western Pacific route. Empire was created by the U. S. Gypsum Company when they started mining gypsum and fabricating wallboard and related products.

The various mountain ranges run in a north-south direction for the most part. To the north of Pyramid Lake is the Granite Range; along the east side of the lake is the Lake Range; and on the southwest side are the Virginia Mountains.

FIGURE 4. TOPOGRAPHY OF THE NORTHWEST NEVADA STUDY AREA.



On the east side of the Truckee Meadows, running north and south, is a lower range of mountains with mountainous terrain to the north and south ends of the valley, forming more or less a bowl.

East of the southern tip of Washoe County is Storey County. This county is almost entirely one big mountain, made up of many small, but tall peaks, known as Washoe Mountains. The major city in Storey County is Virginia City and it sits majestically on the east side, near the top of the tallest peak.

South of Washoe County is Carson City, the State Capital, lying along the eastern slope of the Sierras, surrounded by lower mountains to the north, east and south. The Carson River comes into this valley about due south and turns east out to Lahontan Reservoir.

Douglas County is south of Carson City and is bounded on the south by the Nevada-California State Line. Minden and Gardnerville are the two largest towns in the county. They are both in a very broad and agricultural valley.

Running north and south, to the east of Douglas, Carson City, Storey and part of Washoe County, is Lyon County. Its major cities are Yerington and Fernley. This area is made up of a series of low mountains with many broad valleys. The Carson River crosses the county going due east and ending at Lahontan Reservoir, which is about two-thirds in Lyon County.

Pyramid Lake lies entirely within the Pyramid Lake Indian Reservation. The lake lies in a north-south direction and is about 22 miles long and 8 miles wide. Surface elevation is 3,800 feet. This is a very good fishing and water recreation area.

The two principal cities of Reno and Sparks lie in a valley called the Truckee Meadows which runs north and south with the Sierra Nevada Range to the west. Reno nestles in the foothills of the Sierras on the west side of the valley. The main business and industrial area is rather central with the residential area spreading out north and south on the foothills to the west.

There are two Federal highways through the valley that intersect in downtown Reno - 395 running north and south and Interstate 80 running east and west.

The Southern Pacific Railroad parallels Interstate 80 through Reno and the Western Pacific Railroad has a trunk line in from the north that terminates in Reno.

The city of Reno is bisected by the Truckee River which flows through the southern part of Sparks, also.

The Truckee River, 105 miles in length, originates at Lake Tahoe, which is about two-thirds in California, located in the high Sierras 30 miles southwest of Reno, and terminates at Pyramid Lake, 30 miles to the northeast of Reno. These two lakes are approximately the same size.

The Walker River has its origin near the 11,845 Eagle Peak area at Twin Lakes, in California. It enters the southern tip of Lyon County, running in a northern direction to nearly midway through the county, then turns almost south going out of the county into Walker Lake.

The West Walker River begins near Highland Peak - elevation 10,955 feet - also in California, crossing Douglas County at the southern tip and entering Lyon County near Wellington and joins the Walker River a few miles south of the town of Mason.

The five-county study area covers over 9,500 square miles, with a population of about 150,000.

Generally speaking, these topographical features play a big part in the air pollution problems of this area.

AIR QUALITY ANALYSIS

The regional approach to air resource management requires that all major sources of pollution in an urban area be located within the same air quality control program. One must also consider the influence of pollution upon people and property once it is emitted into the ambient air. The "core" area of a region can be roughly defined on the basis of pollutant source locations and relative emission densities; however, ambient air quality analysis is necessary in order that peripheral pollutant receptor areas may be identified and subsequently included in the air quality control region. This procedure results in an essentially self-contained region in that

it will include within its bounds virtually the entire source-receptor system for a particular area. In this way, too, the possibility of pollutant cross-boundary transport problems will be minimized. The most logical approach for the determination of air quality is to measure quantitatively the pollutant concentrations in the ambient area. Unfortunately, the only available data concerns the Reno-Sparks area. This data is presented on the following pages, but must be tempered with the knowledge that the area concerned is less than one percent of land area of the proposed Region, but contains sixty percent of all the region's people. Data is also included for the Lake Tahoe Basin.

A second approach is the use of diffusion models to predict air quality over the region. This technique was not used due to its severe topography, and also, sufficient emission and meteorological factors were not available.

Particulates

This category contains both the suspended particulates and dustfall. Nevada, being a very open area State with prevalent winds, has an unusually high natural dust content in the ambient air. Conversely, in the proposed Region, industry is not in abundance and therefore, particulate emissions from these sources is somewhat limited. This is not to say that industrial sources cause no particulate problems, as quite the opposite is true. In those areas

where industrial particulate emission sources occur, often quite severe nuisance problems are present in the general area. Industrial particulate sources are found in grids 52, 41, 23 and 22 shown later in this report.

Six suspended particulate sampling stations are located in the Reno-Sparks area. The residential areas average 85 ug/m^3. annually; the commercial-industrial areas 110 ug/m^3.

Dustfall is measured at three locations and the results are shown in Figure 4. Annually, the dustfall for the Reno-Sparks area averages 40 tons/sq. mi./mo.

A soiling index is another measure of particulate contamination. The 1967 and 1968 results are included for three sampling stations. These results have no correlation with visibility reductions; however, they do provide some insight into the nature of the contaminants.

Gaseous Pollutants

Two sampling stations are maintained in the Reno-Sparks area. Results of sampling in 1967 and 1968 are shown in Figure 7. Approximately 60-80 percent of the pollutants are derived from mobile sources. Space heating throughout the proposed Region is accomplished using natural gas, LP gas or light oil as the fuel. Coal is used in extremely small quantities. Some commercial and industrial sources use heavy residual oil for space heating and process heating. This oil does usually contain sulfur in quantities more than one percent.

1968—Dustfall & Atmospheric Sulfation

FIGURE 4.

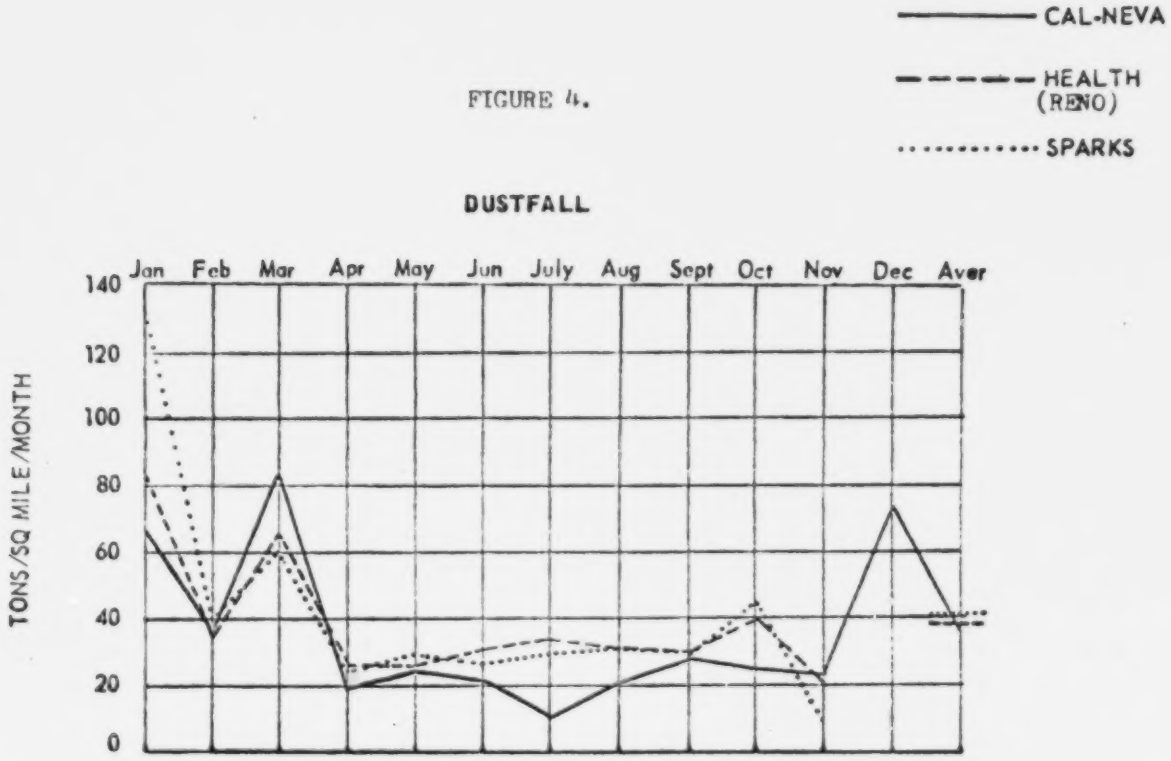
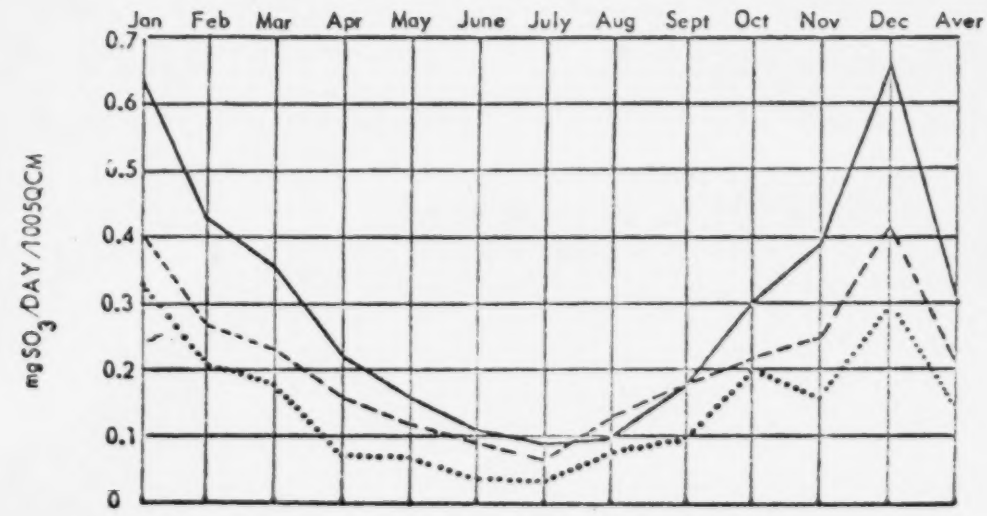


FIGURE 5.



AIR CONTAMINANT MEASUREMENTS

FIGURE 6.

AVERAGE GASEOUS POLLUTANT CONCENTRATION

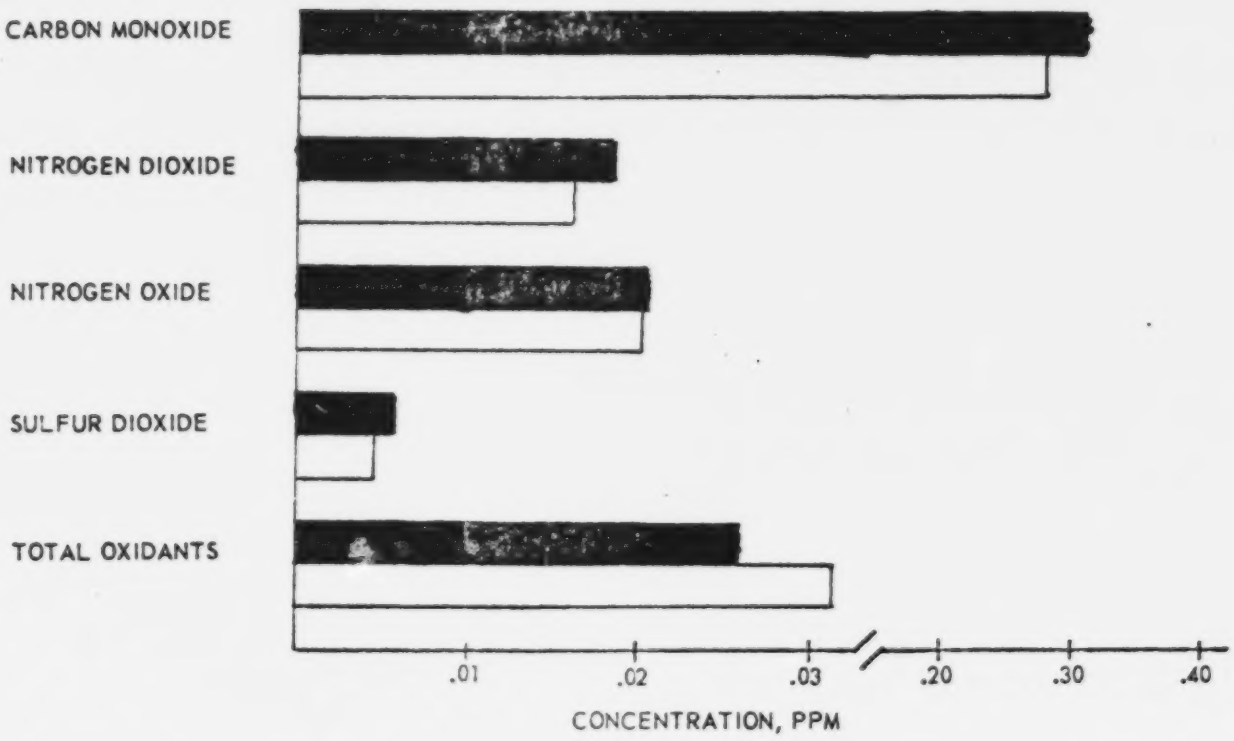
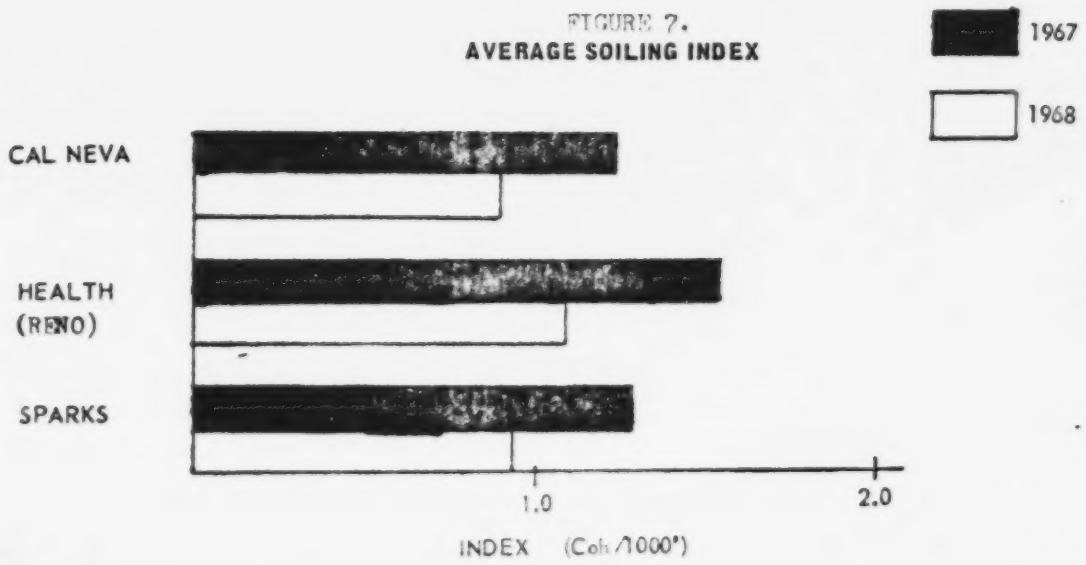


FIGURE 7.

AVERAGE SOILING INDEX



Sulfur oxide discharges from smelting operations are not uncommon in Nevada. The region contains one rather large copper mining operation in grid 52, and undoubtedly some rather significant sulfur problems are associated with it, although to what extent is not known at present. Solid waste disposal in the form of open burning dumps and uncontrolled tepee burners are the usual throughout the region except in the Washoe County portion where a sanitary landfill is utilized.

Grids 41 and 49 encompass the Nevada side of Lake Tahoe. The Lake has a surface altitude of approximately 6,300 feet and is surrounded by higher mountain peaks. Due to rather severe winter weather conditions, sampling is of necessity done in the summer t imes. The suspended particulate loading in the lake basin averages 16.4 ug/m^3.

Carbon monoxide concentration averaged less than 0.1 ppm. Nitrogen dioxide concentration was .001 ppm., while the nitric oxide concentration averaged .003 ppm. The average sulfur dioxide concentration was .0003 ppm. Total oxidant values averaged .024 ppm., which seems high for an area such as this.

Upon further study one finds that oxidant values tend to be higher at the higher altitudes and so the lake results are probably very valid.

PART B

EMISSION INVENTORY

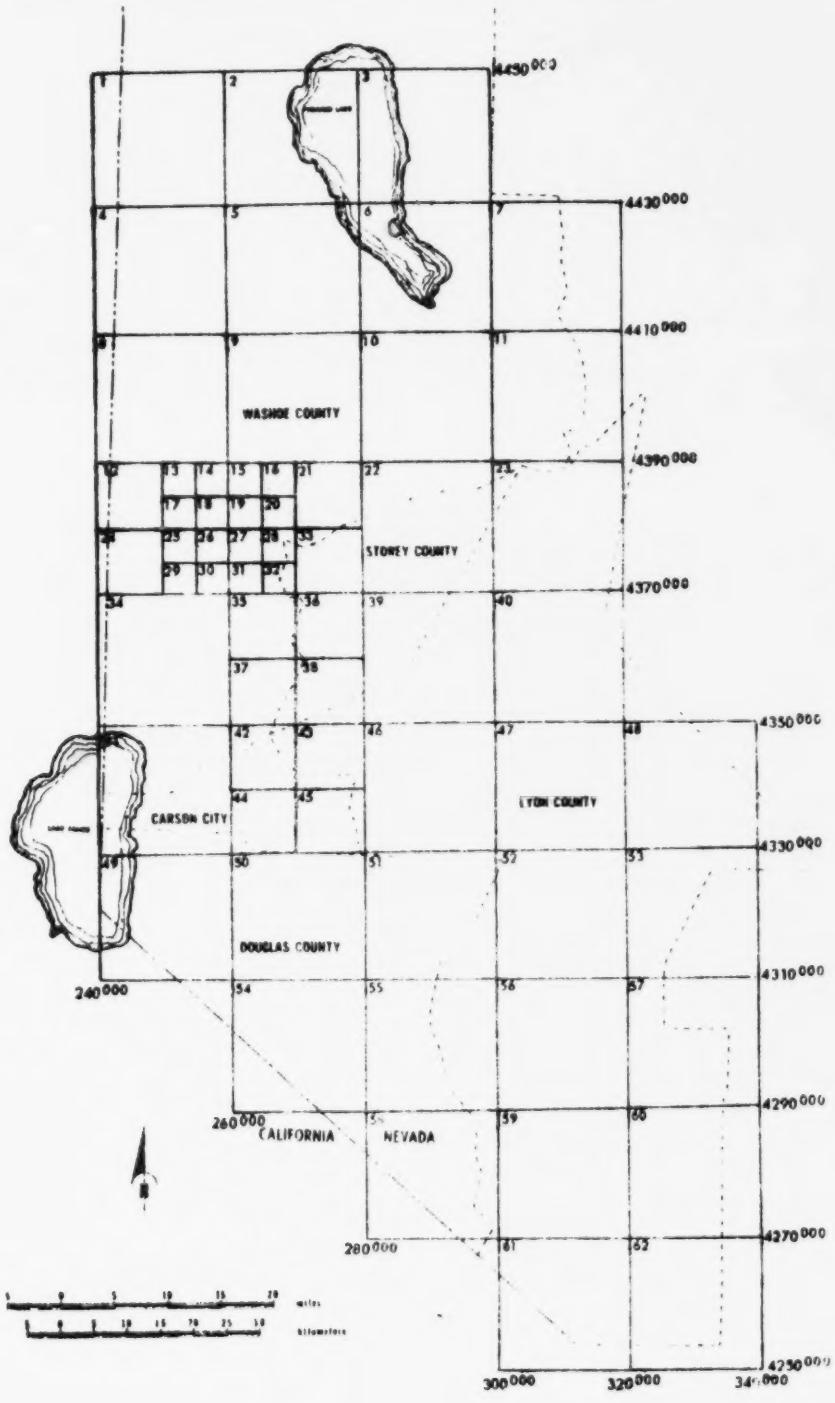
This report is a summary of the Reno area air pollutant emission inventory conducted in March 1970, in cooperation with the National Air Pollution Control Administration. Since all inventories are based upon a calendar year, the data and emissions presented are representative of 1969 and should be considered as indicating the conditions as existed during that year.

The study area, which was chosen on the basis of the distribution of population and air pollution sources, consists of portions of four counties and Carson City surrounding Reno. This area covers approximately 5,392 square miles and had a 1969 population of 148,759.

A grid coordinate system was used to show the geographical distribution of emissions within counties. The study area was subdivided into 38 grid zones ranging in size from 25 square kilometers in the heavily populated and industrialized areas to 400 square kilometers in the rural areas. Figure 8 shows the grid coordinate system.

All sources of emissions were classified into five categories - transportation, stationary fuel combustion, solid waste disposal, industrial processes and evaporative losses. Each of these source categories was divided into two subgroups - point sources and area sources. Facilities which emit large quantities of air pollutants,

FIGURE 8. GRID COORDINATE SYSTEM FOR THE RENO STUDY AREA



were considered individually as point sources, while the remaining contributors such as motor vehicles, residential and commercial fuel users, small industries and on-site refuse burning equipment, were considered collectively as area sources. For this report, fifteen individual sources were classified as point sources.

Emissions were estimated by using various indicators such as fuel consumption, refuse burning rates, vehicle miles, production data, and control efficiencies and emission factors relating these indicators to emission rates. These factors represent average emission rates for a particular source category. Since individual sources have inherent differences that cannot always be taken into consideration, discrepancies between the actual and estimated emissions are more likely in individual sources than in the total emissions for a source category.

As in all emission surveys, the data presented are estimates and should not be interpreted as absolute values. The estimates are, in some cases, partial totals due to the lack of emission factors and production or consumption data. Despite these limitations, these estimates are of sufficient accuracy and validity in defining the extent and distribution of air pollutant emissions in the study area.

SUMMARY

The annual emissions as estimated by the Reno Metropolitan Area Air Pollutant Emission Inventory are:

Sulfur Oxides	2,539 Tons/year
Particulates	39,709 Tons/year
Carbon Monoxide	128,484 Tons/year
Hydrocarbons	17,744 Tons/year
Nitrogen Oxides	10,171 Tons/year

The following is a brief description of the air pollutant emissions as presented in Table 4 and Table 5.

Sulfur Oxides: The largest source of sulfur oxides in the study area was caused by stationary fuel combustion from residential, commercial and institutional heating which accounted for about 67% of the total sulfur oxide emissions. The next important source was motor vehicles which accounted for 22% of the total emissions. The only other significant source was industry with about 6% of the total sulfur oxides.

Particulates: Individual point sources of particulates accounted for over 95% of the total particulate emissions in the Reno study area. Even though the area was void of any heavy industry, it did have a large number of plants in the mineral products industry. The largest sources in these industries were cement operations, copper and iron mining and milling, diatomacious earth operations, and sand and gravel plants.

Carbon Monoxide: In most metropolitan areas the largest source of carbon monoxide emissions is from automobiles and other motor vehicles. This is also true in the Reno area as motor vehicles contribute 98.5% of the carbon monoxide emitted annually. There were no other significant sources of carbon monoxide.

Hydrocarbons: Exhaust gases from motor vehicles was the primary source of hydrocarbon emissions accounting for 57% of the total. Evaporation losses from automobiles which includes losses from the gas tank, carburetor and crankcase accounted for almost 43% of the total hydrocarbon emissions.

Nitrogen Oxides: The major source of nitrogen oxides was the exhaust gas from motor vehicles, which together with other transportation sources contributed 65% of the total nitrogen oxide emissions. Stationary fuel burning sources contributed about 34%.

TABLE 4 SUMMARY OF AIR POLLUTANT EMISSION IN RENO STUDY AREA, 1969 (Tons/Year)

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbons	Nitrogen Oxides
Transportation					
Motor Vehicles	566	1,034	126,507	9,732	6,348
Other	31	165	651	332	262
Subtotal	597	1,199	127,159	10,065	6,611
Stationary Fuel Combusion					
Industry	143	28	0	0	236
Steam-Electric	3	84	0	0	2,185
Residential	557	92	0	26	244
Commercial and Institutional	1,187	160	0	14	675
Subtotal	1,891	365	0	41	3,341
Refuse Disposal					
Incineration	23	117	516	9	35
Open Burning	27	169	773	87	65
Subtotal	51	287	1,290	96	100
Industrial Processes	0	37,856	0	0	117
Evaporative Losses	0	0	0	7,541	0
GRAND TOTAL[a]	2,539	39,709	128,484	17,744	10,171

a - Totals have been rounded.

TABLE 5 PERCENTAGE CONTRIBUTION OF EACH SOURCE CATEGORY TO TOTAL EMISSIONS IN THE RENO STUDY AREA

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbons	Nitrogen Oxides
Transportation					
Motor Vehicles	22.3	2.6	98.3	55.0	62.5
Other	1.2	.4	.2	2.0	2.5
Subtotal	23.5	3.0	98.5	57.0	65.0
Stationary Fuel Combustion					
Industry	5.6	.1	0	0	2.3
Steam-Electric	.1	.2	0	0	22.6
Residential	21.8	.2	0	0	
Commercial and Institutional	45.1	.4	0	0	6.7
Subtotal	72.6	.9	0	0	34.1
Refuse Disposal					
Incineration	.9	.3	.2	.1	.2
Open Burning	1.0	.4	.8	.3	.3
Subtotal	2.0	.7	1.0	.4	.5
Process Losses	0	95.4	0	0	1.0
Evaporative Losses	0	0	0	42.6	0
TOTAL	100.0	100.0	100.0	100.0	100.0

Tables 6 through 19 show additional data obtained from the emission inventory. The following is a brief summary of those tables.

STATIONARY FUEL COMBUSTION

The stationary fuel combustion category is concerned with any fixed source which burns fuels for either space heating or process heating. The four primary sources in this category are industrial facilities, steam-electric plants, residential housing, and commercial and institutional establishments. In the Reno area, natural gas, liquified petroleum gas distillate oil, and residual oil were the major fuels used. Table 6 presents a summary of the fuels consumed in the area and Table 7 the air pollutant emissions from the combustion of these fuels.

TRANSPORTATION

Three types of transportation sources of air pollution are considered in this survey - motor vehicles, aircraft, and railroads. Motor vehicles, which are by far the most significant source in this category, are further subdivided according to type of fuel - gasoline or diesel.

Motor Vehicles

More than 3.5 million miles per day were traveled by motor vehicles in 1969 in the Reno study area. In the process, 110 million gallons of

TABLE 6 ANNUAL FUEL CONSUMPTION IN THE POLITICAL SUBDIVISIONS OF THE RENO STUDY AREA, 1969

Jurisdiction	Steam-Electric Utility	Industrial	Residential	Commercial & Institutional	Total
Natural Gas (Million Cu.Ft.)					
Carson City	0	0	196	650	846
Douglas	0	0	174	1,400	1,574
Lyon	6,600	870	30	130	7,630
Storey	4,600	0	5	0	4,605
Washoe	0	1,000	1,994	700	3,696
TOTAL	11,200	1,870	2,399	2,880	18,351
Distillate Oil (1000 Gallons)					
Carson City	0	0	2,529	100	2,629
Douglas	0	0	111	100	211
Lyon	10	0	1,151	50	1,211
Storey	17	0	35	10	63
Washoe	0	0	13,677	7,000	20,677
TOTAL	27	0	17,503	7,260	24,791
Residual Oil (1000 Gallons)					
Carson City	0	0	0	200	200
Douglas	0	0	0	100	100
Lyon	0	0	0	50	50
Storey	0	0	0	0	0
Washoe	0	1,000	0	6,500	7,500
TOTAL	0	1,000	0	6,850	7,850
GRAND TOTAL	11,227	2,870	16,990	17,000	50,999

NOTE: LPG is included with Natural Gas: Coal is not used in this area.

TABLE 7 AIR POLLUTANT EMISSIONS FROM THE COMBUSTION OF FUELS

STATIONARY SOURCES IN THE STUDY AREA, 1969

(Tons/Year)

Source Category	Sulfur Oxides	Partic-ulates	Carbon Monoxide	Hydro-Carbons	Nitrogen Oxides
Fuel Oil					
Industrial	143	11	0	0	35
Steam-Electric	0	0	0	0	1
Residential	556	70	17	26	105
Commercial and Institutional	1,186	133	14	14	507
Subtotal	1,885	214	31	40	648
Gas					
Industrial	0	16	0	0	200
Steam-Electric	2	84	0	0	2,184
Residential	0	22	0	0	139
Commercial and Institutional	0	27	0	0	167
Subtotal	2	149	0	0	2,690
GRAND TOTAL[a]	1,887	363	31	40	3,334

a - Totals have been rounded.

NOTE: Coal is not used in this area.

gasoline and 10 million gallons of diesel fuel were consumed for highway purposes for the year 1969. Table 8 shows the miles of travel for gasoline and diesel vehicles for each county in the study area. Emissions from motor vehicles and all other transportation sources are summarized in Table 9.

Aircraft

Table 10 shows the air traffic activity at the main airport in the study area. An estimate of the number of flights by engine type was supplied by the traffic controller at each airport and summarized in Table 10. The air pollutant emissions from aircraft include all phases of operation (taxi, take-off, climb out, approach and landing) that take place below the arbitrarily chosen altitude of 3,500 feet. Emissions at cruise altitude (above 3,500 feet) are not of concern in an emission inventory.

Railroads

Railroad operations (mainly locomotive) consume about 1.5 million gallons of diesel fuel per year within the study area. This quantity is about 85 percent less than the amount of diesel fuel consumed by motor vehicles. The majority of this fuel is consumed during switching operations. Diesel fuel consumption data were supplied by each of the major railroads in the Reno area.

SOLID WASTE DISPOSAL

Approximately 235,000 tons of refuse was generated during 1969 within the study area. Table 11 summarizes the air pollutant emissions from this disposal of refuse.

TABLE 8 VEHICLE MILES OF TRAVEL FOR MOTOR VEHICLES

IN THE RENO STUDY AREA

December 31, 1968 (Thousand Vehicle Miles per Day)

Politcal Jurisdiction	Diesel Vehicle Miles	Gasoline Vehicle Miles	TOTAL
Carson City	10	189	199
Douglas	13	251	264
Lyon	11	205	216
Storey	9	173	182
Washoe	84	1,588	1,672
TOTAL	127	2,406	2,533

TABLE 9 SUMMARY OF EMISSIONS FROM TRANSPORTATION SOURCES, 1969

(Tons/Year)

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbons	Nitrogen Oxide
Motor Vehicle					
Gasoline	371	495	126,213	9,068	5,262
Diesel	194	539	294	664	1,086
Evaporation	0	0	0	5,200	0
Subtotal	565	1,034	126,507	14,932	6,348
Aircraft					
Jet	0	77	121	135	68
Piston	0	2	483	91	22
Turboprop	0	0	0	0	0
Subtotal	0	80	605	226	90
Railroads	31	85	46	105	172
GRAND TOTAL[a]	596	1,199	127,159	10,065	6,611

a - Totals have been rounded.

TABLE 10 AIR TRAFFIC ACTIVITY AT THE LARGEST AIRPORT IN THE RENO STUDY AREA, 1969 (Flights/Year)[a]

Type Aircraft	Reno
1 Engine Conventional Jet	6,500
2 Engine Conventional Jet	600
3 Engine Conventional Jet	--
4 Engine Conventional Jet	700
3 Engine Fan Jet	9,000
4 Engine Fan Jet	2,000
1 Engine Turboprop	3,600
2 Engine Turboprop	7,300
4 Engine Turboprop	--
1 Engine Piston	3,200
2 Engine Piston	2,700
4 Engine Piston	--
TOTAL	34,600

a - Flight is defined as a combination of a landing and a take-off.

TABLE 11 AIR POLLUTANT EMISSIONS FROM SOLID-WASTE DISPOSAL IN THE RENO STUDY AREA, 1969 (Tons/Year)

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbons	Nitrogen Oxides
Incineration					
Municipal	--	--	--	--	--
On-Site	23	117	516	9	35
Subtotal	23	117	516	9	35
Open Burning					
On-Site	27	164	762	84	64
Dump	0	4	11	2	0
Subtotal	27	168	773	86	64
GRAND TOTAL	50	285	1,289	96	99

INDUSTRIAL PROCESS LOSSES

Emissions from industrial process losses are shown in Table 12. Particulate emissions from the mineral products industry are the only significant source of air pollution from this category.

EVAPORATIVE LOSSES

Three source categories were considered for evaporative losses - automobiles, gasoline storage and handling, and the consumption of solvents. The hydrocarbon emissions from all sources by evaporative losses are shown in Table 13.

Automobiles

Automobile evaporation losses include gas tank and carburetor evaporation and engine crankcase blowby. Since 1963, most new automobiles were equipped with positive crankcase ventilation (PCV) valves that reduce hydrocarbon emissions from the crankcase by about 90 percent. Due to a lag time in the automobile replacement rate, it was assumed that 20 percent of the automobiles were not equipped with PCV valves.

Gasoline Storage and Handling

There are four major points (excluding evaporation from the motor vehicle of hydrocarbon emissions in the storage and handling of gasoline.)

There are:

1. Breathing and filling losses from storage tanks.
2. Filling losses from loading tank conveyances.

TABLE 12 PARTICULATE MATTER EMISSIONS FROM INDUSTRIAL PROCESSES, 1969 (Tons/Year)

Source Category	Particulates
Mineral Product- Industry	
Cement	14,599
Crushing	11,478
Mining	7,000
Asphalt	169
Diatomoceous Earth	280
Sand and Gravel Operations	5,340
GRAND TOTAL	38,876

TABLE 13 HYDROCARBON EMISSIONS FROM EVAPORATIVE LOSSES, 1969

(Tons/Year)

Source Category	Hydrocarbon Emissions
Automobiles	5,200
Gasoline Storage and Handling	1,613
Consumption of Solvents	
Dry Cleaning Plants	322
Industry	0
Miscellaneous	404
Subtotal	726
GRAND TOTAL	7,539

3. Filling losses from loading underground storage tanks at service stations.

4. Spillage and filling losses in filling automobile gas tanks at service stations.

Approximately 110 million gallons of gasoline and diesel fuel were stored in the study area in 1969. The evaporative losses from this storage and the subsequent handling accounted for 21 percent of the total evaporative losses.

Consumption of Solvents

This category included the consumption of solvents at dry cleaning plants, and the miscellaneous use of solvents by industries, small commercial establishments and domestic units. The consumption of solvents by these categories accounted for 5 percent of the hydrocarbon emissions from evaporative losses.

Emissions by Jurisdiction

The previous section presented the air pollutant emissions by source category. In order to show the contribution of each county to the pollution in the entire study area, their emissions are summarized in Tables 14 through 19.

TABLE 14

TOTAL EMISSIONS BY COUNTY IN STUDY AREA (Tons/Year)

	SO_x	Part	CO	HC	NO_x
Carson City	164	3,011	6,126	996	546
Douglas	91	1,207	6,191	1,136	732
Lyon	113	[23,901]	5,031	966	1,969
Storey	23	67	2,139	717	1,176
Washoe	[2,042]	6,039	[105,990]	[13,919]	[5,738]
	*Home Heating	*Nevada Cement & Anaconda	*Autos	*Autos	*Power Plants & Heating

*Source of largest contributors.

TABLE 15 SUMMARY OF AIR POLLUTANT EMISSIONS IN CARSON CITY, 1969 (Tons/Year)

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydro-Carbons	Nitrogen Oxides
Transportation					
Motor Vehicles	48	105	5,991	536	437
Other	0	0	0	0	0
Subtotal	48	105	5,991	536	437
Stationary Fuel Combustion					
Industry	0	0	0	0	0
Steam-Electric	0	0	0	0	0
Residential	80	11	2	3	26
Commercial and Institutional	33	9	0	0	48
Subtotal	113	21	2	4	75
Refuse Disposal					
Incinerator	2	11	48	0	3
Open Burning	0	15	84	29	10
Subtotal	3	26	133	30	14
Industrial Process	0	2,859	0	0	20
Evaporative Losses	0	0	0	426	0
GRAND TOTAL[a]	164	3,011	6,126	996	546

a - Totals have been rounded.

Table 16 SUMMARY OF AIR POLLUTANT EMISSIONS IN DOUGLAS COUNTY, 1969 (Tons/Year)

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydro Carbons	Nitrogen Oxides
Transportation					
Motor Vehicles	69	157	6,126	632	606
Other	0	0	0	0	0
Subtotal	69	157	6,126	623	606
Stationary Fuel Combustion					
Industry	0	0	0	0	0
Steam-Electric	0	0	0	0	0
Residential	3	2	0	0	10
Commercial and Institutional	18	15	0	0	88
Subtotal	21	17	0	0	99
Refuse Disposal					
Incineration	0	5	21	0	1
Open Burning	0	7	42	14	5
Subtotal	1	12	64	15	6
Industrial Processes	0	1,021	0	0	21
Evaporative Losses	0	0	0	498	0
GRAND TOTAL[a]	91	1,207	6,190	1,136	732

a - Totals have been rounded.

TABLE 17 SUMMARY OF AIR POLLUTANT EMISSIONS IN LYON COUNTY, 1969 (Tons/Year)

Source Category	Sulfur Oxides	Parti-ulates	Carbon Monoxide	Hydro Carbons	Nitrogen Oxides
Transportation					
Motor Vehicles	63	145	4,927	524	525
Other	0	2	1	3	5
Subtotal	64	148	4,928	527	531
Stationary Fuel Combustion					
Industry	0	7	0	0	93
Steam-Electric	1	49	0	0	1,287
Pesidential	36	4	1	1	8
Commercial and Institutional	9	2	0	0	11
Subtotal	47	64	1	1	1,400
Refuse Disposal					
Incineration	1	6	26	0	1
Open Burning	0	14	76	27	9
Subtotal	2	20	102	27	11
Industrial Processes	0	22,669	0	0	27
Evaporative Losses	0	0	0	411	0
GRAND TOTAL[a]	113	23,901	5,031	966	1,969

a - Totals have been rounded.

TABLE 18 SUMMARY OF AIR POLLUTANT EMISSIONS IN STOREY COUNTY, 1969 (Tons/Year)

Source Category	Sulfur Oxides	Parti-culates	Carbon Monoxide	Hydro Carson	Nitrogen Oxides
Transportation					
Motor Vehicles	21	31	5,129	395	277
Other	0	0	0	0	0
Subtotal	21	31	5,129	395	277
Stationary Fuel Combustion					
Industry	0	0	0	0	0
Steam-Electric	1	34	0	0	897
Residential	1	0	0	0	0
Commercial and Institutional	0	0	0	0	0
Subtotal	2	34	0	0	898
Refuse Disposal					
Incineration	0	0	2	0	0
Open Burning	0	1	8	3	1
Subtotal	0	2	10	3	1
Industrial Processes	0	0	0	0	0
Evaporative Losses	0	0	0	319	0
GRAND TOTAL[a]	23	67	2,139	717	1,176

a - Totals have been rounded.

TABLE 19 SUMMARY OF AIR POLLUTANT EMISSIONS IN WASHOE COUNTY, 1969 (Tons/Year)

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydro Carbons	Nitrogen Oxides
Transportation					
Motor Vehicles	363	594	104,332	7,652	4,500
Other	30	162	650	329	257
Subtotal	393	757	104,983	7,981	4,757
Stationary Fuel Combustion					
Industry	143	20	1	0	142
Steam-Electric	0	0	0	0	0
Residential	435	73	14	20	197
Commercial and Institutional	1,126	133	13	13	526
Subtotal	1,705	228	28	35	867
Refuse Disposal					
Incineration	19	95	417	7	28
Open Burning	25	129	561	12	37
Subtotal	44	224	979	19	66
Industrial Processes	0	4,830	0	0	48
Evaporative Losses	0	0	0	4,884	0
GRAND TOTAL[a]	2,042	6,039	105,990	13,919	5,738

a - Totals have been rounded.

PART C

EVALUATION OF URBAN FACTORS

Introduction

The Clean Air Act, as amended, calls for a designation of air quality control regions based on jurisdictional boundaries, urban-industrial concentrations and other factors in order to provide for the adequate implementation of air quality control. The designation of air quality control regions must also be based on a consideration for existing cooperative regional arrangements, State and local air pollution control programs and the patterns and rates of urban growth. The description of the proposed region was covered in the section on topography.

AREA AND POPULATION CHARACTERISTICS FOR
PROPOSED AIR QUALITY CONTROL
REGION
TABLE 20

COUNTY	LAND AREA SQUARE MILES	POPULATION 1969	POPULATION DENSITY 1969
Washoe	2,200	119,965	54.5
Storey	262	678	2.6
Lyon	2,024	8,090	4.0
Douglas	751	6,046	8.1
Carson City	153	15,264	10.0
TOTAL	5,390	150,043	27.9

POPULATION DISTRIBUTION

Economic considerations for the region largely depend upon mining, agriculture and tourism. Existing and potential air pollution problems can be related geographically to areas subject to present or anticipated residential and industrial development. Similarly, air pollution problem areas can generally be identified by studying population statistics since human activity is the basic cause of the air pollution.

The chart shows the population for each of the five counties involved, plus total area and population density figures based on 1969 estimates. These figures are based on permanent residents and do not include the tourist population of approximately 14 million who visit the proposed Region each year and who bring about three million passenger cars in the process.

The projected population growth of about 10 percent per year is expected to take place in the Truckee Meadows Basin and Carson Valley areas with, of course, some increase in all the counties in the region.

The Reno-Stead area, ten miles north of Reno, is expected to show the greatest growth in the next few years in both residential and industrial development.

INDUSTRY

Residents of the proposed Northwest Nevada Air Quality Control Region recognize that they must preserve and protect the whole region from any industries that would in any way adversely affect the environment. This attitude is reflected in the policies of the

Regional Planning Commission of Washoe County by providing strict regulations in land use categories.

Heavy industries in the proposed Region are, for the most part, mining operations. Lyon County has a large open-pit copper mine (grid 52) and a cement plant (grid 23), both being sources of air pollution. Storey County contains a diatomaceous earth mine and processing plant (grid 33) which is causing considerable public clamor for dust abatement. Also located within the county is a large power generation plant which fortunately uses natural gas for fuel, causing a minimum of pollution. Washoe County contains several hot-mix asphalt plants and a wide assortment of light industries such as makers of fixtures, chemical formulators, electronic component manufacturers, metal fabricators, etc. Warehousing has recently become a large part of the economy of Washoe County.

The commercial and industrial development potential for the region is great as vast areas of land are available. Critical drawbacks, however, are the lack of sufficient water, inadequate waste disposal facilities and inadequate sources of power.

There are two Federal highways that meet in downtown Reno. Highway 395, coming from the north carries a heavy commercial as well as tourist traffic load from as far north as Canada. This same highway from the south is heavily traveled both commercially and tourist-wise all the way from Mexico.

Interstate 80 starts at San Francisco and crosses 395 in the heart of Reno. It, too, is heavily travelled, with more tourist

than commercial vehicles at a ratio of 5 to 1. Going all the way to the East Coast, and in part known as Highway 40, it carries a tremendous load of passenger and commercial vehicles.

Three major air lines serve the Reno-Sparks area, deplaning approximately 400,000 persons per year. This does not take into consideration the thousands of private flights into the area.

The Southern Pacific Railroad basically parallels the Interstate 80 Highway going through Reno in an east-west direction. A branch line of the Western Pacific Railroad comes into Reno from the north.

Highway 50 comes into Douglas County from the south end of Lake Tahoe, after crossing Echo Summit (elevation 7,382 feet) from the Sacramento area and follows the east shore of the Lake to Glenbrook, then down over Spooner Summit (elevation 7,100 feet) to Carson City. It is the main street of Carson City and then turns east and crosses Lyon County and on to Fallon. This highway then continues on the East Coast, carrying heavy tourist traffic.

U. S. Route 95 Alternate, begins at Fernley and runs in a southerly direction to Yerington, then east to U.S. 95. U.S. Highway 95 comes out of Oregon and down the length of the State into Las Vegas, then on into California. This is another north-south tourist route.

There are a number of State routes, such as 3, 3C, 22, 27, 17, 33 and 34 that are well travelled paved roads and crisscross the proposed air quality control region.

In addition, there are any number of improved and unimproved dirt roads, plus jeep trails that are well defined and well used by ranchers, hunters and fishermen.

AGRICULTURE

By far the greatest land areas are being used to grow crops and raise animals. This is particularly true in the rich, broad valleys coursed by the river systems, in which are grown everything from alfalfa to garlic and onions. In the vast sagebrush covered areas, cattle raising is the main occupation.

TOURISM

Throughout the Reno, Sparks, Lake Tahoe, Carson City and Virginia City areas tourism is big business, accounting for about 40 percent of the total labor force. The 14 million tourists who visit these areas each year add greatly to the economic growth, as well as the potential for air pollution. Recently, winter tourism has increased greatly due to the increased skiing opportunities.

EXISTING AIR POLLUTION CONTROL PROGRAMS AND LEGISLATION

During the 1967 legislative session, the first State pollution control laws were enacted. This legislation was strictly "enabling" and did not set limits on any contaminant that may be emitted. Presently, the State of Nevada is conducting public hearings on a proposed set of regulations which it feels will set minimal standards in the State.

Only two of the five entities making up the region have air pollution control programs. Just this year, 1970, Carson City adopted regulations and instituted a nominal program. Washoe County has had an air pollution control program since 1964. The program is at the stage where a rather complete emission inventory is available, ambient air quality standards have been set, and a set of strict regulations have beenadopted. The program has good administration, laboratory and sampling facilities, and a good record of enforcement in the field, and is considered one of the better "small programs" in the country.